

GAS & AIR SAMPLING & MONITORING

What does a PID measure?

PID - Photo Ionization Detectors

LEL Explained

LEL Monitors

Infrared Methane Sensors Explained

Landfill Gas Monitors

Calibration Gas

Weather Monitors

Dust Monitor

Dust Sampler

MiniRAE 3000**Portable PID****0-15,000ppm range**

The intrinsically safe hand-held PID from RAE Systems features a powerful built-in piston pump with sample flow rates of 500cc/min. The field rugged PID has excellent response and remote monitoring capabilities for confined space entry and leak detection. It is also used in the field of leaking underground storage tanks and for head space analysis in soil, wells and water. A special sensor design and reliable lamp produces stable base line and span for increased sensitivity and accuracy.

Features

- The patented sensor provides the following unique features: 3-second response time; extended range up to 15,000ppm with improved linearity, humidity compensation with integral, humidity and temperature sensors
- Designed for simple service with easy access to lamp and sensor in seconds without tools
- Big graphic display for easy overview of gas type, correction factor and concentration
- Field-interchangeable battery pack replaced in seconds without tools
- Integrated flashlight for better view in dark conditions
- User-friendly screens, including dataplot chart view
- Integrated RAE Systems correction factors list for more than 200 compounds to measure more chemicals than any other PID
- Multi-language support with 12 languages encoded
- Rugged housing withstands use in harsh environments
- Cleaning and decontamination in water
- Strong protective removable rubber boot

**Specifications**

Display Graphic	4 lines, 28 x 43 mm, with LED backlight for enhanced display readability
Keypad	1 operation and 2 programming keys, 1 flashlight on/off
Direct Readout	Instantaneous reading VOCs as ppm by vol. High values STEL and TWA Battery and shutdown voltage. Date, time, temperature
Range	0 to 999.9 ppm (0.1ppm res) 1000-15,000ppm (1ppm res)
Alarms	95 dB (at 30 cm) buzzer and flashing red LED to indicate exceeded preset limits <ul style="list-style-type: none"> • High: 3 beeps and flashes per second • Low: 2 beeps and flashes per second • STEL and TWA: 1 beep and flash per second • Alarms latching with manual override or automatic reset • Additional diagnostic alarm and display message for low battery and pump stall
IP Rating	IP67 unit off and without flexible probe IP65 unit running
Datalogging	Standard 6 months at one-minute intervals
Calibration	Two-point or three-point calibration for zero and span. Calibration memory for 8 calibration gases, alarm limits, span values and calibration dates.
Sampling Pump	Internal, integrated flow rate at 500 cc/mn Sample from 100' (30m) horizontally and

Low Flow Alarm	Auto pump shutoff at low-flow condition
Communication	Download data and upload instrument setup from PC through charging cradle or optional Bluetooth™ Wireless data transmission through built-in RF modem

Hazard Area Approval

US and Canada: UL, cUL, Classified as Intrinsically Safe for use in Class I, Division I Groups A, B, C, D
Europe: ATEX II 1G EEx ia IIC T4 (pending)
IECEx: II 1G EEx ia IIC T4 (pending)

Temperature -20° to 50° C

Humidity 0% to 95% relative humidity (non-condensing)

Attachments Durable bright yellow rubber boot with belt clip

Size 25.5 x 7.6 x 6.4 cm

Weight 738gm

Sensors Photoionisation sensor with standard 10.6 eV or optional 9.8 eV or 11.7 eV lamps

Battery Rechargeable, external field-replaceable Lithium-Ion battery pack

Ordering Information

ACE059-B116-000

MiniRAE 3000 PID with 10.6 eV lamp. Also includes: Li-ion battery, Datalogging with ProRAE Studio Software Package, Charging/download adapter, Flex-I-Probe™, External filter, Rubber boot, Alkaline battery adapter, Lamp-cleaning kit, Tool kit, Operation & Maintenance manual, Soft leather case.

PID with accessories kit adds:

Hard transport case with pre-cut foam padding, Charging/download cradle, 5 Porous metal filters and O-rings
Organic vapor zeroing kit, Gas outlet port adapter and tubing



MiniRAE Lite**Portable PID****0-5,000ppm range**

The MiniRAE Lite's photoionisation detection (PID) range is 0 to 5,000 ppm. This makes it an ideal instrument for applications ranging from environmental to construction.

Note: this instrument is not rated intrinsically safe.

Key Features

- Proven PID technology—The patented sensor provides the following unique features:
 - 3-second response time
 - Range up to 5,000 ppm
 - Humidity compensation
- Designed for service—Easy access to lamp and sensor in seconds without tools
- Big graphic display for easy overview of concentration
- Field-interchangeable battery pack, replacable in seconds without tools
- Integrated flashlight for better visibility in low light
- Rugged housing withstands use in harsh environments

**Specifications**

Size	25.5 x 7.6 x 6.4 cm
Weight	738 g
Sensors	Photoionisation sensor with standard 10.6eV lamp
Battery	<ul style="list-style-type: none"> • Alkaline battery adapter • External field-replaceable lithium-ion battery pack, if specified
Operating Hours	12 hours with lithium-ion battery
Display Graphic	4 lines, 28 x 43 mm, with LED back light
Keypad	1 operation and 2 programming keys, 1 flashlight on/off
Direct Readout	Instantaneous reading of: <ul style="list-style-type: none"> • VOCs as ppm by volume • High and low values • Date and time
Alarms	95 dB buzzer (at 30 cm) and flashing red LED to indicate exceeded preset limits <ul style="list-style-type: none"> • High: 3 beeps and flashes per second • Low: 2 beeps and flashes per second • Alarm latching with manual override or automatic reset • Additional diagnostic alarm and display message for low battery and pump stall
IP Rating	IP-65
Calibration	Two-point calibration for zero and span
Sampling Pump	<ul style="list-style-type: none"> • Internal, integrated flow rate at 400 cc/min • Sample from 100' (30m) horizontally and vertically
Low Flow Alarm	Auto shut-off pump at low-flow condition
Hazard Area Approval	IECEx Ex ia IIC/IIB Gb T4 -20°C≤Ta≤+50°C
Operating Temperature	-20° to 50° C
Humidity	0 to 95% relative humidity (non-condensing)
Attachments	Durable green rubber boot
Ordering Information	
ACE059-A110-000	
MiniRAE Lite Monitor, Li-Ion battery, 10.6 eV UV lamp, External filter, Green rubber boot, Alkaline battery adapter, Lamp cleaning kit, Tool kit, charger, manual, Soft leather carrying case	
MiniRAE Lite with accessories kit adds:	
Hard transport case with pre-cut foam, 5 Porous metal filters and O-rings, Organic vapor zeroing kit and Gas outlet port adapter and tubing	

PID Holster & Belt

- Frees up both hands for increased safety when climbing
- Military style leg position keeps the instrument at your fingertips
- Easy decontamination
- 45kg rated Velcro - backed holster keeps the instrument secure
- Charge and calibrate instrument without removing it from holster
- Holster is comfortable and allows the wearer to move freely

**Ordering Information****ACE011-3040-000**

Leg Harness / Holster without belt

ACE011-3041-000

Utility belt for holster

EntryRAE**PID & 4 Gas****Confined Space Entry Monitor****Affordable OSHA compliance plus reliable VOC protection.**

The EntryRAE is a 4-gas monitor, plus photo ionisation (PID) detector. Reliable, easy to operate and simple to calibrate, the EntryRAE delivers added protection without added complexity.

Why PID?

Typical 4-gas monitors don't detect volatile organic compounds (VOCs). VOCs are combustible and often toxic at the levels far below 10% LEL. They are commonly found in:

- Fuels, oils, degreasers
- Industrial cleaners
- Heat transfer fluids
- Solvents, paints
- Plastics, resins, adhesives
- Pesticides and herbicides

These are common industrial compounds you find in or bring into a confined space.

Features

- Reliable, accurate VOC detector
- Simple to operate
- Easy to calibrate
- Durable, weather-resistant rubber body
- Data logging included
- Large display with auto-backlight
- Loud alarm
- Bright red flashing LED alarms
- Up to 16 hours of continuous operation
- Interchangeable Lithium-ion and alkaline battery packs
- Charging cradle doubles as an external battery charger
- Powerful pump allows sample draws up to 30m

Sensor Specifications

	Range	Resolution
PID	0-999ppm VOC	1ppm VOC
Oxygen (O ₂)	0-30%	0.1%
Combustible Gases (LEL)	0-100% LEL	1% LEL
	0-5% Volume	1% Vol
Carbon Dioxide (CO ₂)	0-500ppm	1ppm
Hydrogen Sulphide (H ₂ S)	1-100ppm	1ppm

**Specifications**

Size 15cm x 8.3cm x 4.8cm without clip

Weight 567g with battery and clip

Sensors

5 Sensors:

- Protected catalytic bead for combustible gases (LEL)
- Electrochemical sensors for oxygen (O₂) and hydrogen sulfide (H₂S) and carbon monoxide (CO)
- Modular photo ionisation detector for broadband detection of VOCs using 10.6eV lamp

Battery

- Drop-in rechargeable with Li-ion battery pack
- Standard alkaline battery adaptor
- Charging cradle doubles as external battery charger

Operating Hours Up to 16 continuous with Li-ion

Up to 12 hours with alkaline

Display

Large 3.5cm x 4.5cm display with automatic back-lighting in dim light or alarm condition

Keypad 3 button operation

Direct Readout

- Oxygen as percentage by volume
- Combustible gas as percentage of lower explosive limit (LEL), percentage by volume
- VOCs, CO & H₂S as parts per million
- TWA & STEL values for VOCs, CO & H₂S
- High and low values for all gases

Ordering Information**RAE046-XXXX-XXX**

EntryRAE, VOC and max. 4 other sensors, Lithium-ion rechargeable battery, alkaline battery adaptor, 5 external filters, charging cradle, ProRAE Studio software package, computer interface cables, RS232 with USB adaptor, calibration adapter, user manual, shipping case

ACE046-P111-101 EntryRAE for VOC (10.6eV PID), LEL, O₂, H₂S & CO unit with accessories kit

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LEL Explained

LEL sensors are used for the detection of a wide variety of combustible gases and vapors that exhibit different responses.

Combustible gases (or flammable gases) can burn or explode, potentially causing extensive damage to plant and/or personnel.

For a combustible gas to ignite, three conditions are needed:

- gas in sufficient quantity
- air or oxygen in sufficient quantity
- ignition source

Combustible gas must be present in a high enough concentration to ignite. The minimum concentration needed is called the Lower Explosive Limit or LEL.

How does it work?

An LEL sensor consists of matched detector and compensator made from coils of platinum wire embedded within a catalytic bead.

Oxidation of combustible gases and vapours releases heat, changing the resistance of one element with respect to the other – which is detected as an out of balance voltage in the bridge circuit.

LEL sensors have a diffusion barrier to limit the gas flux to the catalytic bead, they tend to have the greatest sensitivity to high diffusivity compounds such as Hydrogen and Methane than Kerosene.

Correction factors have been determined that enable the user to quantify a large number of chemicals using only 1 single calibration (eg Methane).

Applications

- Confined space entry
- Wastewater treatment plants
- Marine and off-shore oil wells
- Landfill operations
- Trenches, silos, railcars
- Coal mines
- Cruise ships
- Sewers and manholes
- Tunnels
- Refineries and petrochemical plants including off-shore drilling and plant shut downs
- Power plants
- Pulp and paper industry
- Steel mills

What's the difference between PID and LEL Sensors?

In summary they have different detection techniques:

1. LEL Sensors are not readily able to detect heavy or long chain hydrocarbons eg. diesel fuels/jet fuels.
2. PIDs use high energy uV light from a lamp to remove an electron from neutrally charged VOC molecule, producing a flow of electrical current proportional to the concentration of the contaminant.
3. The larger the molecule, the lower the energy required – thus the larger the molecule, the easier to detect.
4. Small hydrocarbons such as methane are not detectable with a PID. The energy required to detect methane with a PID exceeds the energy of the uV light produced by the PID lamp

Diffusion vs Pump

Gas monitoring meters like the QRAE, that monitor (Combustibles) LEL, Oxygen, H₂S, CO and exotic gases can come as:

- Unit with a pump
- Unit with no pump (called diffusion heads or diffusion pumps)

The latter relies on the ambient atmosphere to diffuse to the sensor heads before a reading can be taken. Catalytic Bead sensors create a small vacuum which is enough to pull the sample through.

The main disadvantage of pump type meters is the sample is drawn through a gas chamber and takes a few seconds to actually hit the sensors. Diffusion pumps have their sensors placed very close to the atmosphere which gives a faster response time.

Diffusion LEL monitors suit most applications but a pump driven LEL is best for:

- Detection of gases in hard to reach areas, where tubing is needed for easy reach
- Detection of supertoxics (exotic gases) where the specific gravity is different to oxygen

Can I use an LEL for a Landfill application?

No, it is not recommended for the following reasons:

- Although catalytic technology will work up to a certain point it requires calibration on a very regular basis unlike Infra-Red Sensors that come with Landfill Gas Monitors (GA2000's etc).
- Catalytic Technology requires the presence of oxygen – landfill wells monitoring lacks oxygen and therefore LELs will not perform properly in this situation.
- There are a number of chemicals and gases that poison the catalytic sensor and basically kill it in a very short amount of time. These chemicals and gases include silicone which is by far the worst. As silicone is used in a number of compounds (namely as a sealant e.g. silicone rubber) it would be very difficult to ensure that the catalytic technology will not be isolated from any of this.

QRAE II**Pump or Diffusion**

The QRAE II is available as a diffusion or pumped one-to-four gas monitor for detection of combustibles, oxygen, hydrogen sulfide, carbon monoxide or sulfur dioxide.

Key features include an easy-to-change battery pack, a water-resistant case and a new state-of-the-art O2 sensor.

Key Features

- Patented SPE O2™ Oxygen sensor with the following unique features: Lead-free design that complies with RoHS directive and extended life compared to lead-type electrochemical oxygen sensors, resulting in a low cost of ownership.
- Leak-free design, minimizing downtime.
- Best EMI/RFI immunity technology for products in its class, eliminating radio interference.
- Easy access to pump, sensors, filter and battery compartment without exposing electronic components to potential damage.
- IP-65 water- and dust-resistant case.
- Strong, protective, concussion-proof design.

Additional Advantages

- Plug-in sensors: oxygen, combustibles, hydrogen sulfide, carbon monoxide or sulfur dioxide.
- Intuitive simple-to-operate two-button user interface with built-in pump.
- Pump or diffusion models available.
- Cradle doubles as an external battery charger and data transfer connection.
- Rugged housing
- Large graphic display for easy overview of gas type and concentration.
- Rechargeable Lithium-ion battery pack provides up to 14 hours of continuous operation.

**Sensor Specifications**

	Range	Resolution
Oxygen (O2)	0-30%	0.1%
Combustible Gases (LEL)	0-100% LEL	1% LEL
Carbon Monoxide (CO)	0-1000ppm	1ppm
Hydrogen Sulphide (H2S)	0-100ppm 0-1000ppm	0.1ppm 1ppm
Sulphur Dioxide	0.1-100ppm	0.1ppm

Specifications**Size**

Diffusion 12.5cm x 7.2cm x 3.8cm

Pump 12.5cm x 7.2cm x 5.0cm

Weight

Diffusion 250 g

Pump 350 g

Sensors

- Catalytic bead for combustibles
- Oxygen: SPE O2™ (non-consumable Solid Polymer Electrolyte technology)
- Toxic: electrochemical, H2S, CO or SO2

Battery Interchangeable Lithium-ion and alkaline battery packs

Operating Period

Diffusion Up to 14 hours continuous operation with Lithium-ion battery, up to 10 hours with alkaline battery (typical, without alarm)

Pump Up to 10 hours with Lithium-ion battery, up to 8 hours with alkaline battery

Display Graphic 4 lines, with LED automatic back light in dim light or alarm condition

Keypad Two-key operation

Alarms 95dB buzzer (at 30 cm) and flashing red LED

IP Rating IP-65

Datalogging Standard 12 days at one-minute intervals

Calibration Two-point calibration for zero and span

Sampling Pump Optional, internal pump 300 cc/mn

Hazardous Area Approval

• US and Canada: Cl, D1, Groups A, B, C, D, T4

• Europe: ATEX II 2G EEx ia d IIc T4

• IECEx: Ex ia d II CT4

Temperature -20° to 50° C

Humidity 0% to 95% relative humidity (non-condensing)

VRAE**Hand Held 5 Gas Surveyor**

The VRAE is a hand held 1,2,3,4 or 5 gas monitor with built-in sampling pump and optional datalogging. Sensors include new RAE dual range 0-100% Volume and 0-100% LEL, oxygen and three smart interchangeable toxic sensors, or up to four smart, interchangeable toxic sensors.

The internal pump automatically shuts off plus an alarm is activated, if the remote probe tubing crimps or water is sucked onto the field replaceable hydrophobic filter. User selectable, calibrated sensor analog output is available in addition to datalogging.

Features

- Large, alarm activated back light LCD display
- Visual alarm with flashing light
- Large keys usable with gloved hand
- Rigid inlet probe
- 10 hours operation
- Sample collection port
- 16,000 data points download to PC
- Rubber boot for protection

Sensors Options Include

- Carbon monoxide
- Hydrogen Sulphide
- Combustibles/LEL
- Oxygen
- Sulphur Dioxide
- Nitric Oxide
- Nitrogen Dioxide
- Chlorine
- Ammonia
- Hydrogen Cyanide
- Phosphine
- Ethylene Oxide

Applications

- Refineries and petro chemical plants - confined space entry, hot work permits
- Utilities - cable vaults, transformer stations
- Waste water treatment plants - confined space entry
- Marine and off shore oil wells - testing of confined spaces
- Landfill operations - monitoring wells and confined spaces

**Specifications**

Intrinsic Safety	UL & cUL Class 1, Division 1, Group A, B, C, D (US & Canada) EEx ia IIC T2 (Europe) Pending
Size	197 x 70 x 38mm
Weight	568gm w/ battery pack
Detector	Catalytic sensor for combustible gas. Electrochemical sensors for oxygen and toxic gasses
Battery	Rechargeable, snap-in, field replaceable 4.8V, 1.1Ah NiMH battery pack. 4 AA alkaline battery adapter
Operating Hours	10 hours continuous
Battery Charging	10 hrs charge through built-in charger or an ext. battery charger
Display	2 line by 16 digit LCD with LED back light automatically in dim light or alarm condition
Keypads	1 operation and 2 program keys
Direct Readout	Instantaneous (up to 5 values). Oxygen as percentage by volume. Combustible gas as percentage by volume or percentage of lower explosion limit. Toxic gases as parts per million. High and low values for all gases. STEL, TWA for toxic gases. Battery and shut down voltage.
Alarm	90 dB buzzer & flashing LED to indicate exceeded preset alarms

Calibration	Two points field calibration of zero and span gas
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Datalogging	16,000 points download to PC with serial number of unit, user ID, site ID and calibration date
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Datalogging interval	1 - 3,600 seconds programmable
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Sampling Pump	Internal pump, flow rate 400cc/min. Auto shut-off at low flow condition
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Temperature	-20oC to 40oC
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Humidity	0% to 95% relative humidity (non-condensing)
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Ordering Information

ACE018-XXXX-XXX

VRAE unit with combustible oxygen and up to 3 toxic sensors OR combustible, and up to 4 toxic sensors, Rechargeable NiMH battery pack, Filter and O-ring pack, 5" Inlet probe, Gas outlet port adapter, Manual, Rubber boot with belt clip, Alkaline battery adapter.

Rechargeable units additionally include
 -Nickel-Metal-Hydride (NiMH) battery
 -120 or 230 V AC/DC wall adapter (if specified)

VRAE with accessories kit adds

Hard transport case with pre-cut foam padding, 15' (5m) Tygon® tubing, Tool kit

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Infrared Methane Sensors in Landfill Gas Monitors

What is Landfill Gas?

The waste within a landfill will consist of a wide variety of substances, but a large proportion will be biodegradable. This will include animal and vegetable matter, paper and wood.

These substances can be decomposed by micro-organisms within the landfill and this breakdown process produces gas. Landfill gas can be a complex mixture of gases, but a few gases predominate. Initially, carbon dioxide is the main gas, but there can also be significant quantities of hydrogen. Methane is produced during the major part of the decomposition process. Many other gases can be produced in trace amounts and the exact composition of the gas will vary between different landfill sites, different parts of the same site and over time.

Infrared absorption

Infrared absorption is usually the preferred method for measuring methane and carbon dioxide.

Most gases absorb radiation in the infrared region. The wavelength of radiation that is absorbed is determined by the natural vibration frequencies of the molecule. These natural frequencies will depend on the bond strengths, molecule size and shape and mass of the atoms involved. Thus different gas molecules have different natural frequencies and will absorb infrared radiation of different wavelengths. Figure 3 shows the absorption bands of methane and carbon dioxide.

See Geotechnical Instruments
range of landfill gas and
biogas instruments
on pages 161-163



This property is used in infrared absorption to select a specific gas for analysis. By using infrared radiation of the same wavelength as the absorption band, the technique can be made specific to a particular gas - a useful property when analysing one gas within a mixture.

Infrared radiation from a source is passed through the gas to be analysed. Several infrared detectors are positioned to measure the amount of infrared radiation that has passed through the gas. A filter that is tuned to the wavelength of interest is positioned in front of the infrared detector. This then makes that particular detector sensitive to the gas of interest. By using several detectors with different filters a number of different gases can be detected at the same time.

The amount of radiation absorbed will be proportional to the path length through the gas and the concentration of the gas. Since the path length is fixed, the concentration of the gas can be calculated.

Infrared absorption can be made robust, accurate and stable. It also requires little or no routine maintenance and an infrared absorption cell has a lifetime of many years.¹

Can I use an LEL for a Landfill application?

No, it is not recommended for the following reasons:

- Although catalytic technology will work up to a certain point it requires calibration on a very regular basis unlike Infra-Red Sensors that come with Landfill Gas Monitors (GA2000's etc).
- Catalytic Technology requires the presence of oxygen – landfills, well monitoring lacks Oxygen and therefore LELs will not work properly in this situation.
- There are a number of chemicals and gases that poison the catalytic sensor and basically kill it in a very short amount of time. These chemicals and gases include silicone which is by far the worst. As silicone is used in a number of compounds (namely as a sealant e.g. silicone rubber) it would be very difficult to ensure that the catalytic technology will not be isolated from any of this.

¹ Excerpts from "Monitoring Landfill Gas", Article in Asian Environmental Technology Nov '07 - Geotechnical Instruments

GA2000

Landfill Gas Analyser

The industry standard GA2000 is designed to meet landfill monitoring protocols set by Government legislation. Utilised with dedicated software the GA2000 becomes an extremely powerful detection monitoring and change indicator tool.

This equipment has been certified for use in potentially explosive atmospheres in accordance with ATEX directive 94/9/EC. Equipment group and category: EX II 2 G. Protection concept: Eex ibd IIA T1 (Ta = 0 °C to +40 °C).

Features & Benefits

- ATEX certified
- 5 Gases standard
- Peak CH₄ recording
- Simultaneous display of all gases
- Storage of site and ID questions
- Field proven
- Standardises monitoring routines
- Easy transfer of data
- Optional Internal flow
- Optional Event log with technician log
- Data storage 2000 readings and
- Optional GPS

Main Applications

- Landfill sites
- Biogas
- Site investigation

GA2000 & GA2000Plus

GPS Option

The on-board GPS option locates boreholes simply, fast and accurately. Its easy-to-read 'where-to-go' on-screen directions save time especially for technicians on different sites.

- Real time GPS tracking and location
- GPS location of borehole stored with readings
- On-site store locations
- Google Earth mapping



GA2000 & GA2000Plus

GA2000 Plus H₂ Compensated CO Landfill Gas Analyser

The GA2000 Plus utilises new technology to give more reliable readings for Carbon Monoxide (CO), helping determine the presence of fires on landfill. It incorporates the existing technology and features of the industry standard GA2000.

GA2000 & GA2000 Plus Specs

CH₄ 0-70% by specification, 0-100% reading

CO₂ 0-60% by specification, 0-100% reading

O₂ 0-25%

H₂S 0-500ppm *H₂ Compensated

CO 0-500ppm* for GA2000 Plus

Gas Accuracy

	CH ₄	CO ₂	O ₂
0-5%	±0.5%	±0.5%	±1.0%
5-15%	±1.0%	±1.0%	±1.0%
15% Full Scale	±3.0%	±3.0%	±1.0%

Relative Pressure

±500mbar (direct measurement)

Operating Temperature Range

0°C - 40°C

Relative Humidity

0-95% non-condensing

Barometric Pressure Range

± 200 mbar from calibration pressure

Barometric Pressure Activity

± 5 mbar absolute

Battery Life

Typical use 10 hours from fully charged

Charge Time

Approximately 2 hours from complete discharge

Ordering Information

GTIGA2000 GA2000 ATEX Certified Infra-red Gas Analyser - 5 Gas Measures CH₄/CO₂/O₂/H₂S/CO.

GTIGA2K2-E000 GA2000 ATEX Certified Infra-red Gas Analyser (no cells) - 3 Gas Measures CH₄/CO₂/O₂.

GTIGA2K4 GA2000Plus ATEX Certified Infra-red Gas Analyser - CO Version Measures CH₄/CO₂/O₂/H₂S and CO with a Hydrogen compensated CO Cell (Hydrogen level also indicated)

GTIGA2K5 GA2000Plus ATEX Certified Infra-red Gas Analyser NH₃ Version Measures CH₄/CO₂/O₂/H₂S/NH₃

GTIGA2K3 GA2000Plus ATEX Certified Infra-red Gas Analyser H₂ Version Measures CH₄/CO₂/O₂/H₂S/H₂

GTIINTFLOWMAN Internal flow option

GTIEVENTMAN Event log option

GTIGPSKIT GPS option

GTIGAM Gas Analyser Manager Software

GTIUSBLEAD USB Communications Lead

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GEM2000 Plus

Landfill Gas Analyser

The GEM2000 Plus is designed to monitor landfill gas extraction systems. Utilising new technology the GEM2000 Plus gives increased reliability for Carbon Monoxide (CO) readings. It retains the features of the field proven GEM2000.

This equipment has been certified for use in potentially explosive atmospheres in accordance with ATEX directive 94/9/EC. Equipment group and category: EX II 2 G. Protection concept: Eex ibd IIA T1 (Ta = 0 °C to +40 °C).

Features & Benefits

- ATEX certified
- Measures H₂S and CO
- Measures % CH₄ CO₂ and O₂ static pressure and differential pressure
- Calculates balance gas flow (m³/h) and calorific value (KW or BTU)
- Records %LEL of CH₄ Peak CH₄ and user defined comments
- Accepts protocols
- Allows balancing of gas extraction
- Modem for remote download
- Optional Event log
- Data storage 2000 readings and 1000 IDs
- 0-500ppm H₂S readings
- Technician log

Main Applications

- Gas extraction fields
- Flare monitoring
- Landfill sites



GEM2000 Plus shown with optional Pitot Tube



Specifications

CH ₄	0-100% Reading
CO ₂	0-100% Reading
O ₂	0-25%
CO	0-2000ppm (H ₂ Compensated)
H ₂ S	0-500ppm

Gas Accuracy

	CH ₄	CO ₂	O ₂
0-5%	±0.5%	±0.5%	±1.0%
5-15%	±1.0%	±1.0%	±1.0%
15%	±3.0%	±3.0%	±1.0%
<i>Full Scale</i>			

Static Pressure

±500mbar (direct measurement)

Differential Pressure

±125 mbar (direct measurement)

Operating Temperature Range

0°C - 40°C

Relative Humidity

0-95% non-condensing

Barometric Pressure Range

±200 mbar from calibration pressure

Barometric Pressure Activity

± 5 mbar

Battery Life

Typical use 10 hours from fully charged

Charge Time

Approximately 2 hours from complete discharge

Ordering Information

GTIGEM2000 GEM2000 ATEX Certified

Infra-red Gas Analyser (no cells) Measures CH₄/CO₂/O₂

GTIGEM2000PLUS GEM2000Plus

ATEX Certified Infra-red Gas Analyser Measures CH₄/CO₂/O₂/H₂S and CO with a Hydrogen compensated CO Cell (Hydrogen level also indicated)

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Biogas Check

Biogas Analyser

Designed to meet biogas project requirements, this simple to operate analyser is the ideal field instrument for anaerobic digester gas analysis. Easy to use and portable, the biogas check measures gas composition with repeatable accuracy on farms, food processing plants and wastewater treatment facilities.

Benefits

- Enables consistent collection of data for improved analysis and accurate reporting
- Validates flow and gas composition for carbon credit trading
- Field proven technology

Features

- Measures % CH₄, CO₂, and O₂ volume, static, differential and barometric pressures
- Measures additional gases with optional gas pods
- Reads gas temperature with optional temperature probe
- Calculates balance gas and flow (SCFM)
- ATEX certified
- Easy field calibration by user
- Self-test and monitoring on start up
- Stores readings
- Easy-to-read
- User interchangeable filters

Applications

- Farm Digester
- Food Processing
- Wastewater
- Methane Recovery



Specifications

CH ₄	0-100% Reading
CO ₂	0-100% Reading
O ₂	0-25%
H ₂ S	H ₂ S (optional external) 0 – 5000ppm
	H ₂ S (optional internal) 0 – 10,000ppm

Gas Accuracy	CH ₄	CO ₂	O ₂
0-5%	±0.5%	±0.5%	±1.0%
5-15%	±1.0%	±1.0%	±1.0%
15%	±3.0%	±3.0%	±1.0%
Full Scale			

Static Pressure

±500mbar (direct measurement)

Differential Pressure

±125 mbar (direct measurement, less barometric)

Operating Temperature Range

0°C - 40°C

Relative Humidity

0-95% non-condensing

Barometric Pressure Range

± 200 mbar from calibration pressure. Recommended field calibration mix 60% CH₄ 40% CO₂

Barometric Pressure Activity

± 5 mbar absolute

Battery Life

Typical use 10 hours from fully charged

Charge Time

Approximately 2 hours from complete discharge

Ordering Information

GTIBM2K-E000 Biogas Check Analyser
Measures CH₄/CO₂/O₂
GTIBM2K-E000H2S Biogas check
Analyser with H₂S gas pod

INTRINSICALLY
SAFE

Accu-Flo Wellheads

Accu-Flo Wellheads can help prevent landfill gas migration, landfill gas emissions and subsurface fires.

Landfill owners and operators will appreciate the Accu-Flo proven design that meets the special requirements of landfill gas (LFG) recovery for environmental compliance and energy production.

Accu-Flo Wellheads provide operators with the gas extraction control necessary to meet more restrictive environmental and safety regulations, thus preventing unnecessary and costly violations.

Accu-Flo helps maximise gas recovery, minimise surface emissions and subsurface migration, helps control hot spots and prevent subsurface fires.

Benefits

- Compact size
- Easy installation and maintenance
- Built-in gas flow measurement
- Built-in gas flow control gate valve
- Quick connect measurement ports
- High accuracy and repeatability of measurements
- Durable Materials: Sch. 80 PVC housing and couplings, stainless steel impact tube, and polypropylene fittings, elastomeric coupling and PVC
- Flexible interconnects



Simplified Data Collection

Accu-Flo simplifies the complexity of measuring well head data by incorporating key built-in features including a LFG flow measuring device, gas temperature port, quick-connect gas sample ports and a flow control gate valve. The patented design expedited the time required to obtain key well head data and determine necessary flow adjustments using the industry standard instruments, GEM2000 or other field unit.

Quick and Versatile Installation

The prefabricated Accu-Flo assembly, factory tested and warranted, is shipped ready for immediate installation - eliminating the cost and uncertainties of field fabricated units.

Accu-Flo models are available for installation above or below ground on vertical wells or horizontal branch laterals in flow ranging from 1 to over 300 SCFM.

Flow Accuracy and Reliability

The Accu-Flo system is designed to operate in the wet, abrasive environment typical of landfill gas and still provide exacting control and accurate flow measurements with high dependability and consistency.

A patented feature of the Accu-Flo design is the pre-calibrated gas measurement tube assembly (Accu-Flo body) which extends into a standard vertical or horizontal well casing or branch lateral, creating a compact installation.

The measurement tube assembly houses a modified stainless steel impact tube specifically designed for harsh landfill gas applications. Differential pressure readings between the impact tube and measurement tube are used to calculate flow.

To help protect the impact tube from condensate and particulate clogging, common with conventional designs such as pitot tubes and orifice plates, the Accu-Flo uses an enlarged total pressure port opening and a separate protected static pressure port. Also, pre-calibration of the measurement tube with a pre-positioned impact tube eliminates the need to take time-consuming traverse measurements normally required for accuracy.

Model	Size	Flow Rate (SCFM)	Pressure Drop
150	37mm (1.5in)	1-50	0.001 - 3.0
200	50mm (2.0in)	5-125	0.1 - 5.0
300	75mm (3.0in)	35-300	0.1 - 10.00

Calibration Gas

Calibration Gas made easy

Now you can save time, money and headaches normally associated with obtaining and using calibration gas. EnviroEquip supplies the entire range of Air Liquide calibration gases available in handy disposable cylinders to suit your every need.

Bump test your instruments before taking them out in the field

A bump test checks the calibration of an instrument by exposing it to a known concentration of gas. The reading is compared to the actual quantity of gas shown on the Calgas cylinder. If the instrument's response is within an acceptable tolerance range, the calibration is confirmed and the instrument is safe for use.

Why use Calgaz - Disposable Calibration gases?

When a worker steps into a confined space to do a job, everything depends on the accuracy of the safety monitoring equipment. This is why manufacturers, distributors and users of environmental safety monitoring equipment the world over rely on Calgaz calibration gas mixtures.

- No rental deposit or demurrage charges.
- Calgaz eliminates unnecessary costs by providing your calibration gases in lightweight, non-refillable cylinders. You don't have to spend the money normally associated with rental cylinders.

Cylinders for gas stability and long shelf life

The Calgaz multiple-step treatment process for aluminium cylinders ensure the stability and consistency of reactive gases. In addition, Calgaz exclusive internal valve design gives added protection against contamination and damage.

All Calgaz mixtures are prepared by the most accurate method available using gravimetric weights certified by N.I.S.T. Finally, every cylinder is leak-checked with the aid of mass spectrometry technology. Ongoing tests verify a remarkably long shelf-life for Calgaz mixtures.



Commonly requested gas-mixes

Cylinder Type >	7HP (34L)	6D (103L)	8AL (58L)	6DM (58L)
Isobutylene 100ppm/air	ALE003671	ALE003105	•	•
CH ₄ 2.5% (50% LEL) / air	ALE003662	ALE003089	•	•
Zero Air (99.999% N ₂)	•	ALE003132	•	•
CO 100ppm, CH ₄ 2.5%, O ₂ 21% / N ₂	•	ALE003022	•	•
H ₂ S 25ppm / N ₂	•	•	ALE003322	•
25ppmH2S/ 100ppmCO/ 2.5%CH4/18%O2/N2	•	•	ALE003337	•
CH4 50% v/v	•	•	•	ALE003602
CH4 60%, CO2 40% v/v	•	•	•	ALE003605
Fixed Flow	713 ALE004107	715 ALE004111 ALE004116	715 ALE004111 ALE004116	715 ALE004111 ALE004116
Demand Flow	ALE004140	ALE004136	ALE004136	ALE004136
Many more gases & combinations are available - please contact us with your requirements				

Cylinder Specifications

Cylinder Size	Contents Full Service Pressure	Service Pressure PSIG	Dimensions Length x Dia.	Internal Water Vol L ³	Tare weight	Recomm. Regulators	Outlet Fitting
7EOC	17 litres	240	279x73mm	1L ³	2kg	713	CGA 600
7HP	34 litres	500	279x73mm	1L ³	3kg	713	CGA 600
6D	103 litres	1,000	351x82mm	1.52L ³	4.8kg	715, 716, 1700	5/8" -18UNF
6DM	58 litres	1,000	203x82mm	0.80L ³	2.4kg	715, 716, 1700	5/8" -18UNF

All cylinders composed of Steel except 8AL which is made of Aluminium

Regulators

The integrity of your sampling accuracy depends on the effectiveness of your gas regulating equipment. Each regulator is manufactured under rigorous Statistical Process Control and has a two year warranty. All regulators are permanently engraved with model number, flow rate and lot tracing number and are 100% tested to meet product specification.

700 Series Regulators

These single stage piston type regulators are equipped with a control valve that allows constant gas flow for easy ON/OFF. Models 713, 715 and 718 have an option for preset flow. Each model is equipped with a cylinder pressure gauge.



Specifications

Model	Delivery pressure	Max. Inlet Pressure	Cylinder Pressure Gauge
713	140 kPa	3,500 kPa	0-3,400 kPa
715	400 kPa	6,900 kPa	0-6,900 kPa

Seals Viton®A

Seat Teflon®A

Bonnet Nickel-plated Brass

Gauges Chrome-plated Brass

Inlet - Model 713 1" x 20

Inlet - Model 715 5/8" x 18

Outlet 3/16" Hose Barb

Delivery Weight 0.5kg

Demand Flow Regulators

The simplest way to calibrate

Demand Flow regulators (DFRs) are the simplest way to accurately calibrate your instrument. When turned on or opened, the regulators will only let the flowrate of gas through that the instrument is demanding. No more, no less. This means you can't over force a higher flow rate through the instrument or starve it of calibration gas. Both situations could cause false calibration results.

- No more gas bags to calibrate from
- The fastest and simplest calibration method
- Minimises calibration gas wastage
- Easy to operate



Ordering Information

ALE004136 Demand flow regulator for 6D size (103L) bottle

ALE004140 Demand flow regulator for 7EOC (17L) or 7HP (34L) bottle

Portable Lab/Field Case

The Portable heavy duty impact resistant plastic Lab/Field Case can hold two 6D size non-refillable cylinders, regulator and tubing. It is a safe and convenient system for carrying and storing two 103 litre at 1000 psig calibration standards.



Ordering Information

ALE004208 Plastic calibration gas carry case (only). Fits 2 x 6D bottles.

Gas and regulator sold separately

Tedlar Sample Bags

Tedlar bags can be used for indoor air sampling, hazardous waste sites, leaking underground storage tanks, stack sampling, soil gas sampling, gas blending, calibration test standards and most other gas sampling needs.

Using air bags is a reliable way to calibrate gas monitoring equipment. Most meters have an internal sample draw pump. The flow rate of these pumps can vary from small to many litres per minute. And as these pumps wear out, their flow rates tend to drop off. To avoid having to get a regulator or flow control device to exactly match the flow rate of the meter, it is simple to fill a gas bag with the calibration gas, then insert the inlet probe of the meter and let the meter sample at its own natural pump rate. This ensures a high degree of accuracy when calibrating.

Tedlar gas sampling bags are made of 2mil PVF (Tedlar) film. Tedlar is tough durable and considered chemically inert to a wide range of compounds.

All bags feature an eyelet and single 2-in-1 fittings that combine the valve and septum into one.



How to use a Tedlar bag for sampling

- Flush the bag at least three times with purified air or nitrogen before use.
- Attach a piece of 6 mm OD Teflon or similar tubing from the hose/valve fitting of the bag to the outlet fitting of the pump or gas bottle.
- Loosen the knurled screw on the bag, open the valve and tighten the knurled screw to lock the valve in place.
- Activate the sampling pump or bottle and note the start time and any other pertinent information necessary. Avoid filling any bag more than 80 per cent of its maximum volume.
- At the end of the sampling period, turn the pump off and close the valve on the bag.
- Tighten the knurled screw to lock the valve closed. Note the ending time if necessary.

Ordering Information

CELTED1L 17.7cm x 17.7cm, 1 L

CELTED3L 25cm x 37cm, 3 L

EEQ23305 25cm x 57cm, 5 L

Supplied with single

Stainless Steel Fitting

Sample Bag Chamber

The EnviroEquip Sample Bag Chamber allows negative pressure provided by any air sampling pump or vacuum hand pump to draw a gas sample into a tedlar bag.

The sample is drawn into the bag without passing through the pump and there are no contamination issues.



Ordering Information

EEQSB1450 Sample Bag Chamber

Hand Vacuum pump and sample bags sold separately

**Logging Rain Gauge -
RG20**

**Perfect for applications like
Catchment Measurement,
Rainfall Intensity, Hydrology and
Irrigation Control.**

The RG20 is a compact, robust, automatic rain gauge. It consists of an inbuilt tipping bucket rain gauge sensor, windows software, data logger, rechargeable battery and solar panel. The rain gauge automatically sends its information to the data logger, which processes and stores the data in its memory. The data is then available for collection by personal computer either onsite or remotely via telemetry.

The rain gauge sensor is factory calibrated so that each system is ready for use immediately. It can be used for an extended period without any need for adjustment. There are no electrical connections to be made, no mechanical assembly just mount the unit on a suitable base and switch it on. Thanks to its compact and innovative design, the Envirodata Logging Rain Gauge is easy to carry to site, easy to set up, and easy to operate immediately.

The unit's memory provides up to 29,000 readings, facilitating high-intensity data collection or long intervals between data collection. Data is stored in 3 independent secure areas with battery backup. Usually, daily summaries are stored in Memory Area 1, hourly data in Area 2, and rainfall intensity data in Area 3. If the system's software should fail, perhaps as a result of a nearby lightning strike, an automatic circuit ("watch-dog") will restart the logger within a minute, ensuring that data storage is uninterrupted. The internal, real-time clock ensures that the correct date and time are always stored with the data.

Features

- Stand-alone, self-recording unit
- Level Bubble
- Corrosion Resistant Materials
- Robust Design
- Simple Recalibration Procedure
- Low Power Consumption

Applications

- Catchment Measurement
- Flood Studies/Alerts
- Rainfall Intensity
- Meteorological Rainfall Monitoring
- Agriculture and Horticulture
- Hydrology
- Irrigation Control

**Specifications**

Operating Units	up to 450mm/hour
Data Storage	29,000 readings
Resolution	0.2mm
Power Supply	6V rechargeable battery (internal). Capacity for 6 weeks without sunlight
Solar Panel	1.0 watt panel - maintains battery with 3 hours bright sunshine per day.
Weight	2.5 kg
Dimensions	375mm (height) x 203mm (diameter)

Ordering information

EVDRG20	Logging rain gauge with solar panel
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Weather Stations

WeatherMaster 1600

The WeatherMaster 1600 package consists of four integrated electronic weather sensors, an internal data logger, solar panel, 2 metre powder-coated stand and EasiAccess database and reporting software.

The WeatherMaster 1600 is an ideal, economical weatherstation for a variety of research, agricultural and industrial applications. It's innovative integrated design is compact and light enough to be readily portable, however the unit is quite robust and can withstand remote siting in harsh locations.

Measures:

- Wind speed
- Wind direction
- Air temperature
- Relative humidity
- Optional 5th sensor, up to 100m away
- Readily upgradable to the WM20 model
- Stores 100 days of daily data, 65 days of hourly data and approx 4 weeks of 15 min data

WeatherMaster 2000

The WeatherMaster 2000 is a compact automatic weather station designed to suit a variety of research, agricultural and industrial applications. The WeatherMaster 2000 package consists of six integrated electronic weather sensors, an internal data logger, solar panel, 2 metre powder-coated stand, automatic evaporation calculation and EasiAccess database and reporting software.

Measures:

- Wind Speed
- Wind direction
- Air Temperature
- Relative humidity
- Rainfall
- Solar Radiation (& evaporation rate)
- Optional 7th sensor, up to 100 m away
- Stores 100 days of daily data, 65 days of hourly data and approx 20 days of 15 min data

Common Features

- Includes Windows based graphing, database and reporting software
- Solar powered, durable stainless steel and powder coated aluminium construction
- Provides current readings plus 15 minute, hourly and daily summary



AD40 Software (Optional)

Vector Analysis of Wind Speed

Accurate recording of wind data while the wind is varying in speed or direction, or both, within the reporting period of the system can be difficult. In the case of monitoring airborne pollution it can be vital.

As an example, using the standard (scalar) values available with most systems, half a minute of wind from the East and half a minute from the North would be reported as a wind direction of North-East. However, if the Easterly wind blows at a speed of 10 knots, the effect of Northerly gusts at 30 knots would be to blow airborne particles more North than East.

The AirData software resolves the difficulty of accurate measurement by vector analysis or the net (combined) effect of wind speed and direction. The AirData software also records highest wind gust for each reporting period and provides the data necessary to calculate particle dispersion if required.

Sensor Specifications

Air Temp	-15°C to + 50°C, Accuracy +0.20C
Relative humidity	Electronic capacitance type. Accuracy + 5%, Range 10-90%
Rainfall	Tipping bucket mechanism, 0.2 mm resolution
Wind Speed	3 Cup 66mm Anemometer, Resolution 0.1 kph, starting threshold 1kph
Wind Direction	Optical shaft encoder, resolution 6 deg, Accuracy ± 6 deg
Solar Radiation	Global incoming with cosine correction, Accuracy + 5%, Cosine accuracy +3%
Extra Sensors (optional)	One only Barometric pressure, soil temp, or extra sensor same as the above excluding rainfall.
Other specifications	
Datalogger	104K battery backed RAM, stores a total of 29,000 data readings (plus time and data stamp)
Battery	6 volt 3.0 AH internal sealed rechargeable gel cell - capacity for 6 weeks operation without sunlight
Solar Charger	1.5 watt panel - maintains battery with 3 hours bright sunshine per day
Weight	7 kg excluding mounting bracket
Communication	RS232 6 pin serial connection, 300 to 9600 Baud
Ordering Information	
EVDWM16	Weather station with mounting bracket & software
EVDWM20	Weather station with mounting bracket & software
EVDAD40	AirData vector analysis software (optional)

High Volume Dust Sampler

This design provides many significant advantages over previous units including:

- Constant air flow - maintained well within 1% of the preset flow rate in normal operating conditions.
- True mass-flow sensor - no need for temperature and pressure corrections.
- Low energy consumption because motor load is determined by the filter.
- Load and not by mechanical restrictions.
- Low wear and long life because of low load - the vacuum pump has been proven in power stations at full load around the clock for many years. The absence of other mechanical or moving parts eliminates problems found in some products.
- Low noise, quiet running - does not attract attention or annoy neighbours.
- Soft start drives - ensuring the start current demand is kept at a very low level.
- User-friendly filter collection and replacement - no more struggling with fragile tissue on-site in bad weather. The unique removable filter support and transport cover allows filter loading and recovery in a protected laboratory environment without risk of losing the sample.
- Secure casing - preventing dust and rain ingress while permitting easy access for service.
- The flow set incorporates well-proven PM10 and PM2.5 Heads allowing it to sample a variety of particle sizes. The heads have been wind tunnel tested to ensure accurate cut points.



Hi-Vol with PM10 or PM2.5 head



Hi-Vol with TSP head

Specifications

Hi-Vol Head Options

PM10	collects particles smaller than 10microns
PM2.5	collects particles smaller than 2.5micron
TSP	collects total suspended particles without separating different sizes

Air Intake	Uniform, 58,000mm ² nominal air intake
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Power Input	240V, 50Hz
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Nominal Current	4 A (at 70n.m.c Air Flow and Clean Filter)
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Start Current	Switching Transient up to 5.0 A. Ramp up current 4 A
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Vacuum Pump / Motor

Three Phase, 50Hz, 1.3 kW

Motor Drive	Variable Frequency, Soft Start
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Flow Control	Mass Flow Sensor and PID Controller (Unaffected by variation in the ambient air temperature and pressure)
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Flow Control Precision

Better than 1 SCMH

Noise Profile (when running at 70 SCMH with clean filter and silencer)

At 1 meter = 50dba

At 2 meters = 44dba

At 4 meters = 38dba

At 6 meters = 35dba

At 8 meters = 32dba

Filter Support	230 x 280mm (removable) (2 off, one with transport cover supplied as standard)
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Filter Size	20.3 x 25.4cm (8 x 10 inch) (Nominal)
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Cabinet Dimensions	400 x 340 x 1050mm High 450 x 450mm square
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PM10 Head Dimensions	710mm Diameter + 500mm Height Increase to overall height
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Overall Height	1140mm Nominal
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Weight	47 kg
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Temp Range	-10°C to +40°C
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Flow Setting Range	20-100 SCMH
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Flow Indication Range	20-100SCMH
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Australia: For customer service, call 1300-735-295
Visit us online at: www.thermofisher.com.au
New Zealand: For customer service, call 0800-933-966
Visit us online at: www.thermofisher.co.nz

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